DOCUMENT RESUME

ED 084 854 EM 011 676

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TITLE	Nature and Use of Instructional Media.
INSTITUTION	Japanese National Commission for UNESCO, Tokyo.
PUB DATE	72
NOTE	58p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Directories; *Instructional Media; *Instructional Technology; Media Selection; Technological Advancement
IDENTIFIERS	Japan

ABSTRACT

The purpose of this booklet is to introduce newly developed instructional media that are being used in Japan. After short discussions of the teaching-learning process, the functions of instructional media, and the classification and characteristics of instructional media, the instructional media currently in use are discussed. Final sections deal with combinations of various media and optimizing the teaching-learning process. (RH)

ED 084854

NATURE AND USE OF INSTRUCTIONAL MEDIA

JAPANESE NATIONAL COMMISSION FOR UNESCO

1972

EM 011676

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NATURE AND USE OF INSTRUCTIONAL MEDIA

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FOREWORD

The Workshop of the Experimental Project on Programmed Instruction in Asia held in February/March 1970 in Tokyo as the first phase of the Unesco's Experimental Project on Programmed Instruction in Asia, adopted the recommendations for the future action in programmed instruction; inter alia, dissemination and exchange of information and materials among Asian countries.

In pursuance of the recommendation, the Japanese National Commission for Unesco is now issuing a Newsletter on the said Experimental Project which contains the information about the latest development in the field of programmed instruction in the region. In addition to this, the National Commission has taken an initiative to prepare a reference book on new educational methods and techniques for distribution among those concerned.

The development of programmed instruction will be accompanied with more use of new educational media and devices to increase its efficiency. The present booklet is designed to introduce newly developed instructional media which are being used in this country. Some of them are still at the experimental stage and their better use is to be explored in the future.

Acknowledgement is due to Professor Takashi Sakamoto of the Tokyo Institute of Technology and Professor Hiroshi Yoshida of the Tokyo Seitoku Jinior College who prepared this volume.

It is sincerely hoped that this publication will be of use to those who are interested in this field.

March 1972

Kikuo Nishida
Secretary-General
Japanese National Commission
for Unesco

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CHAPTER I.
TEACHING-LEARNING PROCESS

The core of teaching-learning process is an interaction between teachers and learners, where some behavioural changes are produced as a result of their mutual information transmission and reception.

When a learner wants to learn any subject and to solve any problem, he sometimes feels it rather difficult to do so, i.e., to find his problem and the method of solving it or evaluate his own behaviours by himself. Therefore, he needs teacher's helps to do this.

Fig. 1 shows teaching-learning process which consists of 8 steps.

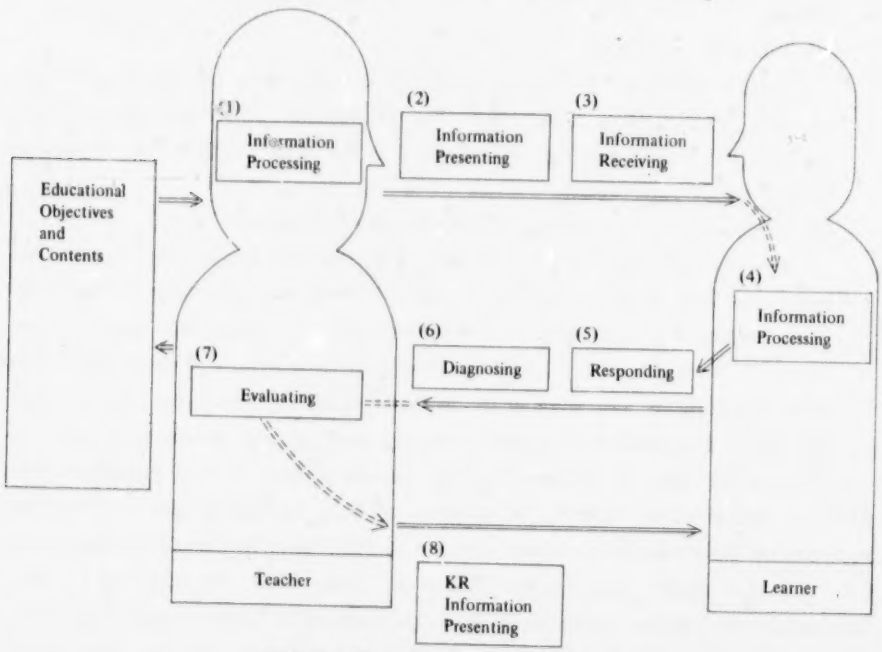


Fig. 1 Teaching-Learning Process

(1) Information processing (by teacher)

Teacher evaluates learner's achievement, personality, physical ability and educational objectives and methods, and decides the relevant objectives and methods.

(2) Presentation of information

He presents a series of information which may be useful for helping learner to attain the educational objectives.

(3) Reception of information

Learner receives the information transmitted from teacher. And he knows teacher's intention and demands, and the contents of the subject.

(4) Information processing (by learner)

Learner interprets and understands what teacher has presented. He thinks, judges, reasons about the problems, and then he decides how to behave.

(5) Response of learner

As the results, he makes response to teacher. For example, he sings a song, expresses his opinions, writes down the result of the problem solution, etc.

(6) Teacher's diagnosis

Teacher observes learner's behaviour and knows how learner behaves and changes.

(7) Teacher's evaluation

Teacher evaluates the quality and degree of learner's learning by collating learner's behavioural changes with the educational objectives. Then, teacher presents the supplementary information or the next information depending upon learner's performance.

(8) Presentation of Knowledge of Results (KR) to learner

By the presentation of teacher's KR, learner knows the degree and quality of his learning. KR is a kind of feedback information which has many types. For example, in responding to his behaviour, teacher says, "good", "wrong", "no", "well", "huum", "wonderful", "interesting" and sometimes repeats and summarizes learner's opinions. Sometimes teacher gives him many non-verbal KR; nodding, smiling, winking, and making gestures.

These eight steps of teaching-learning process include 3 way communication which is the principal function in effective teaching-learning process – i.e., communications from teacher to learner (steps (2), (3)), from learner to teacher (steps (5), (6)) and again from teacher to learner (step (8)). Through this 3 way communication, teacher could know how his teaching is effective and suitable to learner, and could direct his course of teaching concretely. On the other hand, learner can know how well his learning is progressing and how sure he can make his way of learning. So, teacher should establish firmly this 3 way communication between many learners and teacher himself.

CHAPTER II.
FUNCTIONS OF INSTRUCTIONAL MEDIA

Educational technology is to be used effectively to make this possible – by means of the educational devices and equipment, and computers, by effective teaching techniques, by arranging various types of learner groups, by designing various kinds of the instructional course and programming, by preparing other optimal educational conditions and environment for learning, and by improving instructional processes through effective evaluation.

Especially, instructional media including educational devices and equipment aim to expand the 3 way communication in teaching-learning process, and computers aim mainly to expand information retrieval and electronic data processing function of teacher.

Fig. 2 shows the comparison of the conventional instruction with the instruction expanded by instructional media.

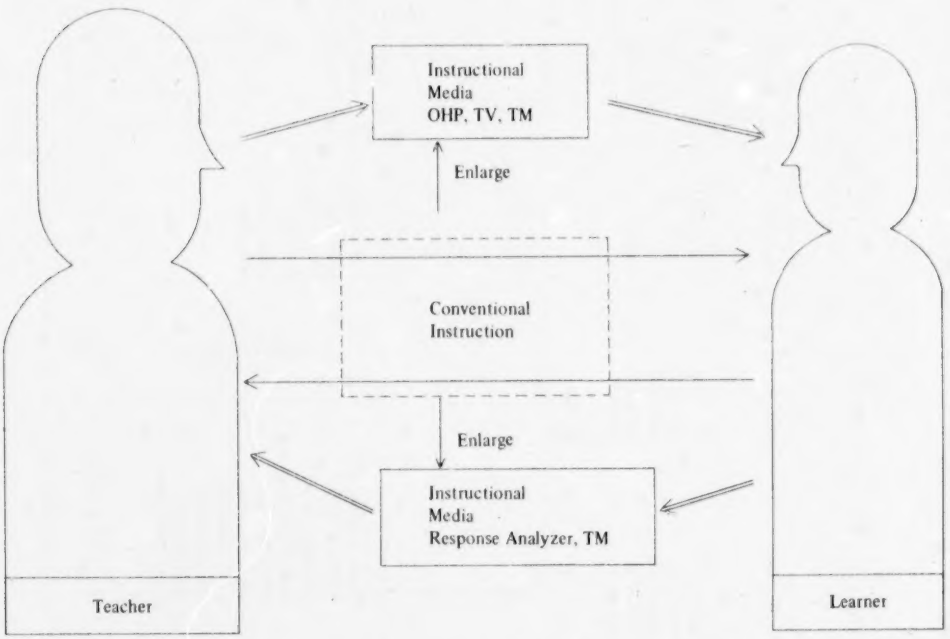
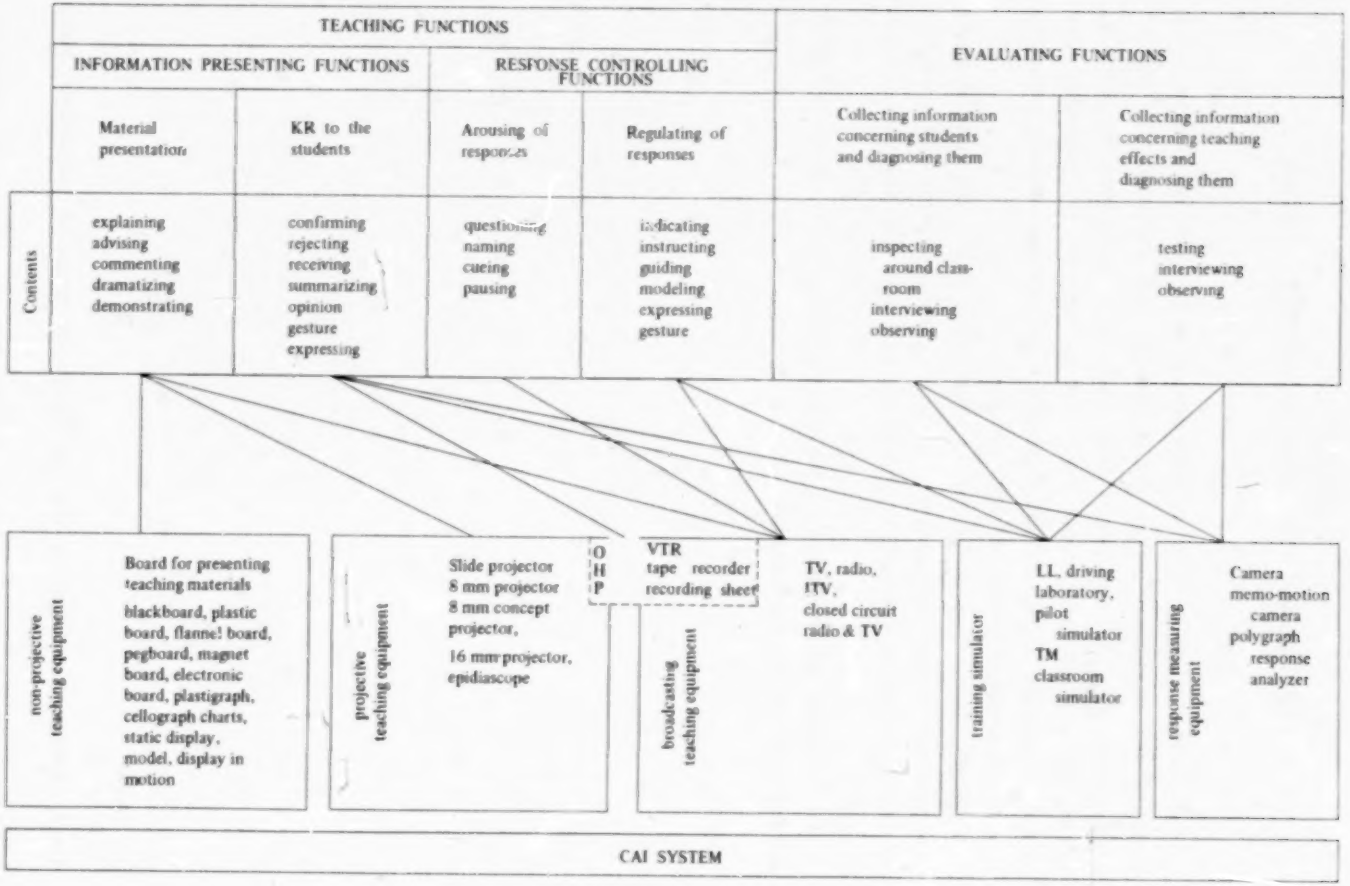


Fig. 2. Expansion of Teaching-Learning Process by Means of Instructional Media

Teacher's information presentation including KR – such as verbal instruction, facial expression, gestures, writing on the blackboard, showing the maps, and so

Fig. 3. Relationship between Teacher's Functions and Instructional Media.



on – is expanded by means of OHP, TV and Concept Film Projector, etc. And Teacher's evaluating activities such as observing learner's behaviours and examining learner's workbook are expanded by means of Response Analyzer and VTR, Camera, etc.

Many teaching devices partially enlarge the instructor's teaching functions. Fig. 3 shows the classification of the instructor's teaching functions. First of all, the instructor's teaching function can be divided into instruction and evaluation; then the instructional function can be divided again into presenting information and controlling response. Then the function of presenting information is sub-divided into material presentation and KR to the learners; and response controlling function is subdivided into arousing of response and regulating of response. On the other hand, evaluation function is divided into two parts, collecting of information concerning learners and diagnosing of them, and collecting of information concerning teaching effects and diagnosing them also.

These teaching functions of the instructor should not be isolated in the classroom, but mutually and closely interrelated. For example, while instructors are giving explanation to the learners, they observe their gestures and expressions. They ask individual learners question while explaining and giving them opinions.

In the class-room the various teaching functions of the instructor are naturally exercised but it does not mean that they are always balanced. The presentation of functional teaching material such as commenting, explaining and demonstrating is more important in the directing type of teaching of subject matters. On the contrary, in the non-directing type of teaching of subject matters, there is more weight placed on the KR to learners and arousing of response, such as confirming, rejecting, summarizing, receiving, gesture and pausing. In motor skill training, there is more weight placed on response control such as indicating, instructing and guiding. Therefore in using various teaching devices, these points must be considered to promote efficiency in education. As indicated at the bottom of the figure, non-projective teaching tools and projective teaching equipment are of function of material presentation. Broadcasting equipment is of function of material presentation and response control. Again, training simulators mainly have the function for KR to learners, response control function and evaluation function. Finally, response measuring equipment is of function for only evaluation.

It is the CAI system which draws our attention here. This equipment expands in all the teaching functions though it cannot easily expands its functions in all the items listed in the diagram. More research is essential in order that it may take place of human gestures and expressions.

In the use of such media in teaching-learning process, the following must be

taken into consideration. The educational broadcast and audio-visual education especially expands the function of material presentation, and the control of responses in the class-room, but it lacks very important teaching functions such as KR and evaluation. Therefore, it is important to fill in these missing functions. In order that the teacher may make up for these functions, it is effective to make the learners discuss the subjects, to give them supplementary content, to let them write a report, etc. For those learners listening to educational broadcasts, it is necessary to provide them with an intensive schooling course during a definite period.

CHAPTER III.
CLASSIFICATION AND CHARACTERISTICS OF INSTRUCTIONAL MEDIA

Fig. 4 shows the system of instructional media which serves the expansion of the 3 way communication. In this figure, * means the media which are being used nation-wide, ** indicates the media which are being used in schools for the purpose of research and development of educational technology, and x shows the media which are tested to use mainly in the research organization.

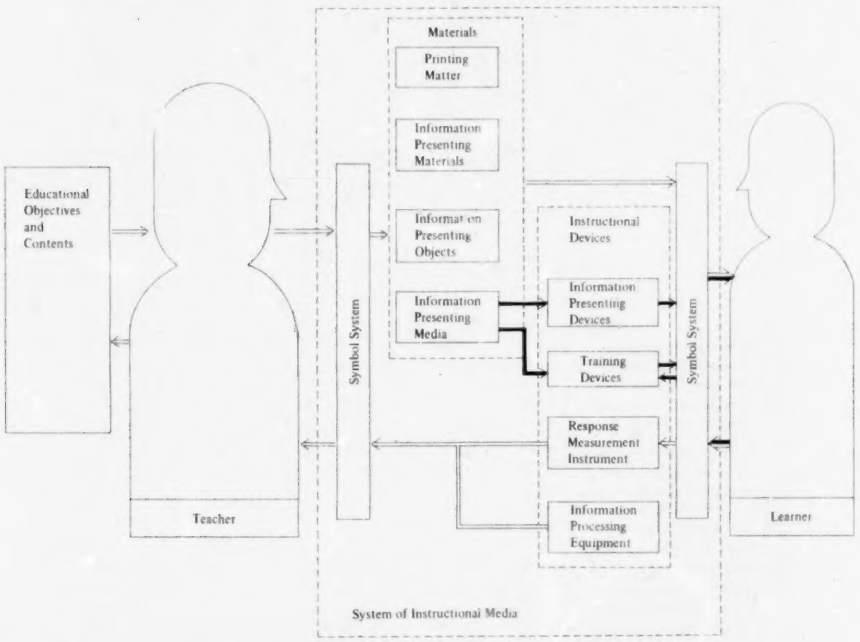


Fig. 4. System of Instructional Media

* Symbol System – characters, numerals, graphs, tables, figures ...
* Printed Matter – books, magazines, pamphlets ...
* Information Materials for Presentation – blackboard, flannel board ...
* Information Objects for Presentation – maps, charts, models, pupets, demonstration play ...
* Information Media for Presentation – slide, filmstrip, TP, film, concept film, tape, sheet, record, video tape ...
* Information Devices for Presentation – projector, VTR (VCR, VSR, SV, VD,

EVR, CVR) ···

** Tranining Device – simulator, VTR

** Response Measurement Instrument – Response Analyzer, camera, VTR

** Information Processing Equipment – Computer, Sorter

Table 1 shows one example of classification of characteristics of main instructional media by classifying 30 items. Such classification may be useful for teachers to understand optimum use of instructional media.

Table 1. Characteristics of Instructional Media

		Printed matter		Information presenting material	Information presenting object				Broadcasting equipment				Response measurement instrument	Training devices	Information processing equipment	
		Textbook	Programmed book	Blackboard	Model	Concept film	Film	O H P	Use of broadcasting education	Correspondense education by broadcasting	ITFS CCTV	Televised still picture	Use of television for CAI	Analyzer	Simulator	Remote access	C A I
Teaching function	Material presentation	◎	◎	○	○	◎	◎	○	◎	◎	◎	◎	◎	×	○	◎	○
	Knowledge of results	△	○	×	△	×	△	○	×	△	○	×	◎	○	◎	×	◎
	Arousing of responses	○	◎	△	○	◎	○	○	◎	◎	◎	×	◎	×	◎	○	◎
	Regulating of responses	○	◎	△	△	○	○	△	○	◎	◎	×	◎	×	◎	○	○
	Evaluation and diagnosis	×	○	×	×	×	×	×	×	×	○	×	○	◎	○	×	◎
Assistance for learning function	Information acceptance	◎	○	○	◎	◎	◎	◎	◎	◎	◎	◎	◎	×	○	◎	◎
	Information processing	○	◎	△	○	△	○	○	○	○	◎	○	○	○	○	○	◎
	Response to information transmission																
	Response to the tasks																
	Response of controlling																
	Self-evaluation	△	◎	△	○	△	△	○	○	○	○	○	◎	○	○	○	◎
	Information retrieval	○	△	×	△	△	△	×	×	×	△	◎	○	×	△	◎	◎
	2 way communication	×	◎	×	△	△	×	△	×	×	○	△	○	○	○	△	◎
	3 way communication	×	○	×	△	△	×	△	×	×	○	×	○	○	○	×	◎
Objective	Knowledge	◎	◎	○	○	◎	◎	◎	○	◎	○	◎	◎	○	×	○	◎
	Skill	×	△	×	○	×	○	×	×	○	○	×	○	×	◎	○	○
	Ability	○	△	○	○	△	○	○	○	○	◎	△	○	○	○	△	○
	Attitude	○	△	△	○	◎	○	×	◎	○	◎	×	○	×	△	△	○
Cost	Cost	○	△	◎	△	△	△	△	△	△	△	?	?	×	×	×	×
	Operational cost	◎	◎	◎	○	×	△	○	◎	○	△	?	?	○	◎	○	×
	Number of learners	◎	◎	△	△	△	◎	○	◎	◎	△	◎	◎	△	△	○	△
	Cost/ no. of learners	◎	◎	◎	△	×	◎	◎	◎	○	○	○	○	△	△	△	△
	Preparation																
	Preservability	○	○	◎	○	△	○	◎	○	△	○	◎	○	△	△	◎	○
	Repeatability	○	○	○	◎	△	◎	◎	×	△	◎	◎	○	×	◎	◎	◎
	Use of existing system								◎	◎	○	○	○			△	△
Way of use	Utility																
	Practicality	◎	○	◎	○	○	○	◎	◎	◎	○	○	○	○	◎	○	△
	Individual learning	◎	○	○	○	×	○	×	○	◎	×	◎	△	×	◎	◎	◎
	Group learning	◎	○	○	○	◎	○	◎	◎	○	○	△	◎	◎	×	△	×

CHAPTER IV.
USES OF NEW MEDIA IN TEACHING-LEARNING PROCESS

In Japan, numerous types of educational equipment and instruments are extensively utilized according to their respective characteristics. Audio-visual teaching materials assume a major proportion of those equipment and instruments, being used chiefly as complementary instructional instruments for having the goals of learning attained precisely within the defined hours of instruction in class-rooms.

In consonance with recent diffusion of educational equipment, the teaching materials adapted to each type of such equipment have also been developed. While educational equipment and instruments function as a communication medium in learning activities, they will lose the significance, unless the teacher is familiar with the characteristics of each equipment and incorporate them effectively in the instructional process. It should be always kept in mind that the educational equipment and instruments are not all-powerful in themselves for education, but function as just one of complementary educational methods. By introducing various types of educational equipment and instruments into the spot of instruction, it is made possible to enlarge the sphere of learners' experiences, present the teaching materials freely regardless of the physical limitation to the time and space and help students grasp the contents of instruction accurately. Introduction of educational equipment and instruments involves plenty of time and labour for their adjustment and preparations as well as large expenses, but pleasant study can be made with them, as the comprehensive instructional system is completed.

We do not necessarily have to be particular about too sophisticated instruments with high-level functions, since the favourable results of study can be duly achieved with the ones, that can be simply and easily installed and handled, such as radio sets, television sets, slides and OHP(overhead projectors). In this regard, it should be borne in mind that, even if the films, records, recorded tapes, video recorded tapes, etc. for presentation of instructional contents should be prepared in a big quantity beforehand, they would be of little use, if teachers lack the zeal for their proper management and if those materials are not well adapted to the characteristics of those instruments.

1. Radio and Television

In Japan, the radio course on the English language for average audience was

initiated in 1925, and the educational broadcast for schools in 1935. In recent years, the short-wave broadcast and FM broadcast have also been introduced, so that the educational radio programmes have become affluent both in contents and quantity. While radio quickly spread to the nation due to its comprehensiveness, prompt reporting nature and simplicity, repeated exercise of a certain radio programme through its recording has become practicable since around 1951 as a result of the development of a magnetic tape recorder. And such recorded radio programmes has become swiftly popular because they are usable whenever one wants. In utilizing educational radio programmes at school, one of the two alternative methods is employed, namely, the method of having those programmes used for each class-room by installing an independent radio set or magnetic recorder in each class-room, or the method of broadcasting the programmes, received at a defined place in a school, to the whole school through a closed-circuit loud speaker.

In the field of television, daily telecast of educational programmes got under way in 1953 with 15 minutes allocated to one subject. Then, an independent educational TV station was instituted in 1959, and kidergarten programmes came to be telecast in colour in 1960. The quality of TV school programmes has remarkably improved during the last 18 years, now reaching and advanced level in the world. At present, they are widely used by a great number of schools because of their superior contents. There are varied types of programmes, such as those designed for direct teaching, those for appreciation and those functioning as teaching materials helpful to attainment of goals of study.

Photo 1. School Lesson Provided by Using Television

Television pictures are small and are inferior in quality to the reflexes of other audio-visual instruments and printed materials, but are actively used at school by video recording them in video tape recorders for reproduction.

Photo 2. TV and VTR

And also by using independent programmes produced with an industrial television camera(ITV), the previous formula of depending only on one-way traffic from the communicator to the communicated can be amended.

2. Slide Projector

Slide films are usually made on 35-mm. films encased in cardboard mounts or on rolled films. Slide films are one of the essential materials used in presentation of the information through educational equipment and instruments.

Slide films are cheap and easy to handle. By using those films, the same learning contents can be disseminated to all learners similtaneously and their attention can be drawn to one point. By presenting teaching materials through slide films, the learners' thinking function is stimulated and freely developed. Unlike movies, slide films can have the duration of projection freely adjusted, can be repeatedly projected and can enlarge static pictures. Therefore, students are enabled to make careful observation and gain adequate understanding, while the aims of instruction can be made clear and appropriate. Moreover, slide teaching materials can be adapted to any part of learning contents, and slide films can be

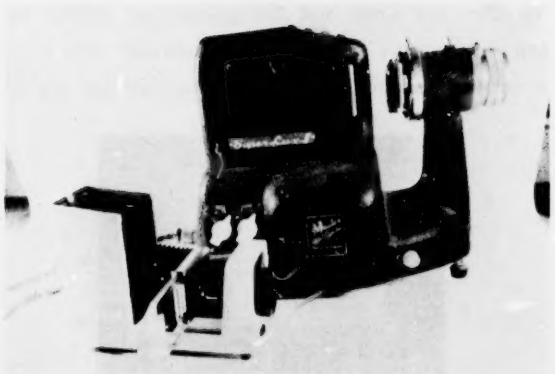


Photo 3. Slide Projector

made easily by students.

Two types of slide films are available. One is the traditional ones, which are projected frame by frame, and the other is the ones, encased in a special magazine and put in a slide projector, which are automatically changed and projected serially like movies.

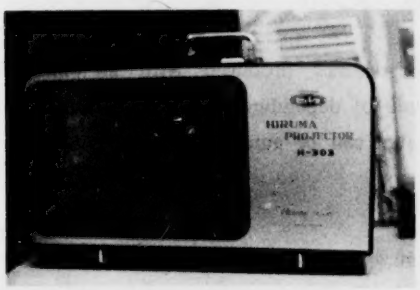


Photo 4. Slide Projector

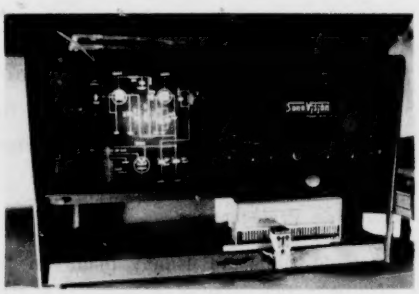


Photo 5. Slide Projector

Photo 6. Slide Projector

Description through slide films can not help being prosaic because pictures are projected on a screen in a dark room so as to be presented in better and clearer images. In order to amend this defect, more sophisticated slide projectors have been developed, such as the ones, in which a magnetic tape recorder is kept so that the tape's reproducing sound is synchronized with the moving of films, the ones, which automatically move films by putting a special signal into the tape, and the ones, which contain a screen on which to project.

Slide teaching materials, adapted to text-books, instructional contents and curricula, are on public sale, while plenty of devices, sensitive materials, and other types of materials for self-production are available.

It will be the most effective in teaching to use self-produced slide film teaching materials. There are two ways of producing slide films. One is for a teacher to make negatives by taking pictures of letters, real objects, drawings and pictures and then to produce slide films by taking pictures of those negatives again. And the other is for him to produce slide films by taking pictures of those articles, as mentioned above, on a reversal film from the outset.

By the way, black-and-white slide films can be produced cheaply in a short time by using Kalver films. Under this method, neither a dark room nor chemicals is required. To begin with, the Kalver process film, which derives from polyester film, is hardened by uniformly applying to it thermoplastic resin containing Diazo compounds which are sensitive to ultraviolet rays. Next, this Kalver film, upon which a black-and-white or colour negative is put, is exposed to ultraviolet rays, so that a latent image is formed on the part penetrated by ultraviolet rays. Then, by heating the latent image, nitrogenous gas is generated and its foams are formed and fixed on the resin, reflecting the light in diffusion, so that a slide film is made.

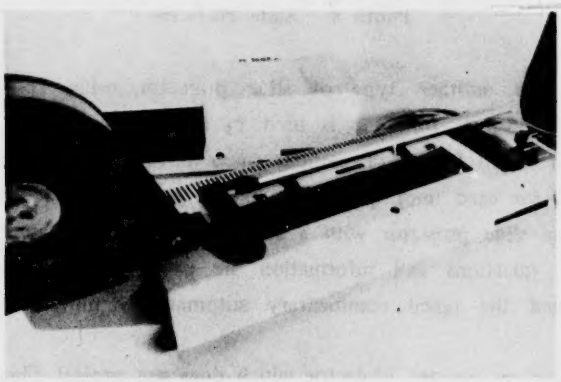


Photo 7. Kalver Printer

Slide films are mostly mounted on cardboards for each frame. But there are also the following cases. One is the use of auto slide projectors, which project serial contents in consonance with the sound by employing 35-mm. single-frame strip roll films. The second is the case, where 50-100 frames of 35-mm. standard films, mounted on cardboards of 2 inches by 2 inches each, are put into a round rotary magazine. The third is the case, where 25-30 frames of slide films, kept in a rectangular magazine, are automatically projected through a projector containing a screen, accompanied by the commentary recorded on a magnetic tape. Since slide projectors became cheaper and accessible of late, there have been many cases, where slide projectors with a screen are prepared for each group of students and are used for their personal study by showing them the order of study and the method of experiments to be made with films and synchronizing slide films with the recorded sound.

Photo 8. Slide Projector

There is also another type of slide projector using 16-mm. films that are cheaper than 35-mm. films. It is used in the following way. First, teaching materials, taken in 30 frames of pictures on a 16-mm. film and arranged in two lines (15 frames for each line), put into a plastic jacket of punch card size. Then, fixing it on the slide projector with a screen and magnetic tape recorder(cassette tape recorder), questions and information are projected for students' study by having films and the taped commentary automatically moved while using stop signals.

There is also an opaque projector which does not project filmed pictures like slide projectors, but projects the reflected light produced by exposing opaque

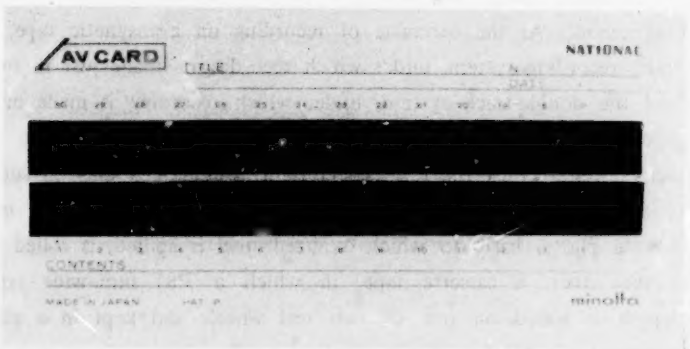


Photo 9. 16-mm. Slide Film

materials and real objects to a strong light. This projector is widely used in projecting, in an enlarged size, books, real objects, newspapers and printed materials up to the size of 16 cm. by 16 cm. and thickness of 6 cm. It also can enlarge small objects to the 6 to 20-fold larger size. Yet, it is unavoidable that, the angle of projection has to be limited and the projected pictures are made rather dark.

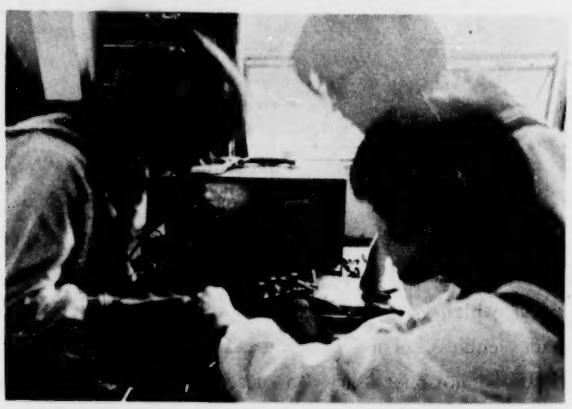


Photo 10. Slide Projector and Guidance of Experiments

3. Magnetic Tape Recorder

Nearly all of recorders used at school are the magnetic tape recorders in which magnetic tapes are employed. Like slide films, recorders are one of the educational instruments indispensable for presentation of the information, since it

is easy to handle them and the recorded materials can be repeatedly used. Generaliy speaking, both console-type recorders and portable recorders are prepared at school. As the formulae of recording on a magnetic tape, there are the full-track recording system, under which recording is made just in one line on a tape, and the double-track system, under which recording is made in two lines or in upper and lower lines on a tape. Recording is usually made under the double-track system, whilst the full-track system is employed only in special cases.

There are two types of magnetic tapes, one, an open reel tape, in which a 6.25 mm.-wide plastic base, to which oxidized steel is apllied, is rolled on a tape reel, and the other, a cassette tape, in which a 3.81 mm.-wide tape of the defined length is rolled on one of two reel wheels and kept in a plastic case. Cassette tapes have been getting popular rapidly, since they can be simply mounted on or taken off from recorders, are easy to handle and conserve and moreover, are cheap.

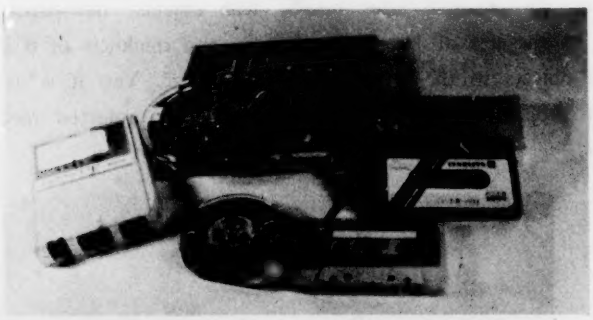


Photo 11. Recording Tape

As to the types of the tape, the one of double-track recording system each for 60-, 90- and 120-minute recording is available. The cartridge type of one is also available, in which a magnetic tape is rolled on a reel wheel put in a plastic case and made endless. This is used exclusively for musical performance or reproduction. It is not necessary to describe herewith the characteristics of a magnetic tape recorder, but, in view of the lack of visual factors being unavoidable in this kind of recorder, which presents the information through reproduction of sounds and voices, it will be necessary to make simultaneous use of paintings, posters, cards, slide films, etc. for its three-dimensional and more effective application.

In recent days, there have been many cases, where auditory presentation and visual presentation are combined by applying magnetic powder to the back of a

Photo 12. Cassette Tape Recorder

Photo 13. Cassette Projector

8-, 16- or 35-mm. film or a printed material. Since the tone quality differs for each magnetic tape recorder and the reproduced voice is not the same as the human voice, such care should be taken lest learners should feel unpleasant when they hear the reproduced voice.

While there are various ways of using a magnetic tape recorder, the method is also adopted of providing each student with a recorder or a sheet recorder for personal study, because it is found effective at times as for certain subject areas or subjects, to have students make personal study on one side, conformed to the discrepancy in their scholastic ability, while providing them with simultaneous instruction on the other. A cassette projector, as shown in Photo 13, is also used for this purpose. That is, in order to prevent the students, who are slow to understand, from being left behind, students are made to study by themselves with a cassette tape interlocked with a 16-mm. film, thus enabling them to perform study at their own pace by repeating the process of hearing, speaking and comparing. In using a magnetic tape, too, the method, as indicated in Chart 1, is also adopted, for the same purpose, in which electrical pulse signals are recorded before or after the recorded commentaries and teaching materials and the tape's movement is automatically stopped by those signals.

The cassette tape recorder, as indicated in Photo 14, which reproduces the recorded materials and signals, enables students to study at a slow pace, since the tape begins to move for reproduction of the commentary, once a button is pushed, and stops

with a signal.

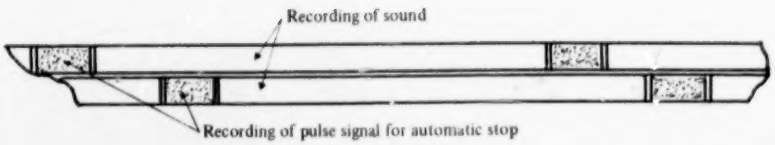


Chart 1. Cassette Tape

In view of most of cassette tape recorders being small in their output, it is better to provide each student or a small group of students with a recorder when a cassette tape recorder is used for simultaneous lesson in a class-room.

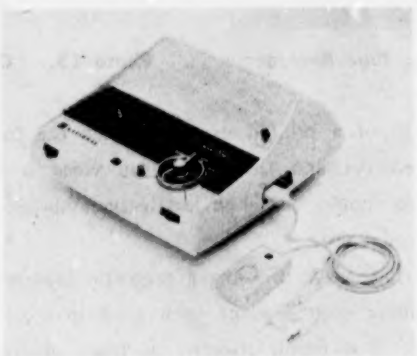


Photo 14. Cassette Tape Recorder

While lots of tapes are needed for a cassette tape recorder, the apparatus for preparing printed tapes quickly in advance is called a cassette tape duplicator.

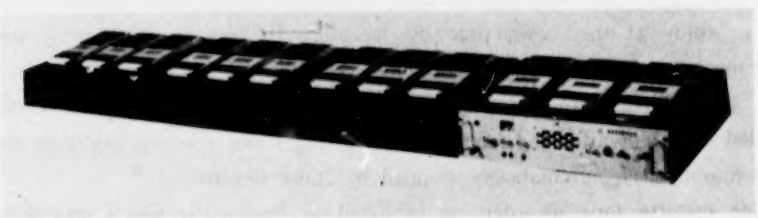


Photo 15. Cassette Tape Duplicator

The necessary number of cassette tapes are prepared in a short time by

transmitting the voice to a child recorder from the mother tape, namely, the tape, in which a teacher recorded the teaching materials in advance. A mother tape can be prepared also by recording the voice of a video tape, radio or television. Various types of cassette tape-recorded teaching materials, – dealing with English conversation, subsidiary materials for study of English, literary works, materials for study of an electronic computer, etc. – are published by publishing companies, radio and TV stations, record firms, etc.

4. Magnetic Sheet Recorder

Unlike a magnetic tape recorder, it reproduces the recorded materials, as a recording head rotates or reciprocates on the printed sheet or disc, to the back of which magnetic iron fillings are applied. It is not completely satisfactory in terms of the tone quality and the duration of recording, but enables individual students to perform self-study while undergoing simultaneous or group lessons, producing the favorable results of study. Therefore, it is in wide use at school.

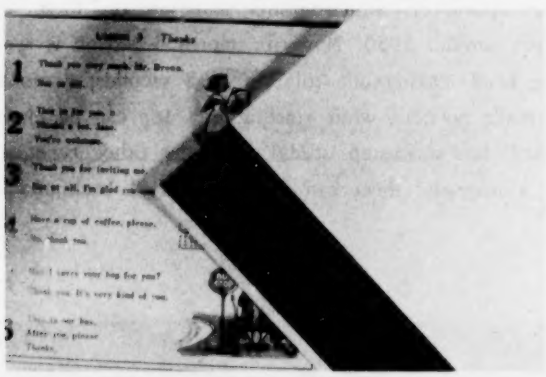


Photo 16. Magnetic Recording Sheet

The commentary and questions are recorded on the back of a sheet, to which around 0.01 mm.-thick magnetic is applied, and the questions to be presented are printed on its surface. Each learner fixes this sheet on a recorded materials reproducer and perform study by moving a recording head and listening to the sound while looking at the printed materials on the surface. In this process, information is obtained from both the sound and the printed medium. Demagnetization and recording can be made freely, while duplication of a sheet and 5- to 10-minute recording can also be made. Questions are printed in bright

colours on the surface of the sheet, while magnetic ink is applied to its back. With this sheet fixed on a recorded materials reproducer, the model pronunciation and commentary on English conversation are provided to students. It is possible to record on one sheet about 4-frame questions of around 30-second duration.

Photo 17. Magnetic Sheet Recorder

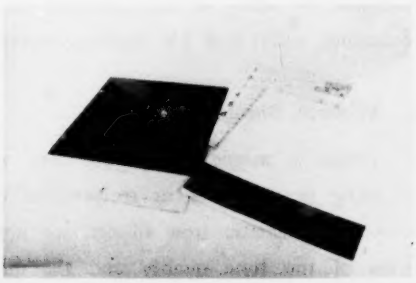


Photo 18. Study with Magnetic Sheet

A magnetic reproducer, which prints materials on these sheets, has been actively used since around 1950. Now, its improved version is available, in which, with a recording head making one rotation in 8 seconds, 4-minute recording and reproduction is made possible, while starting and stop can be made at any chosen time. It is suited for small-step study. And the other type of device is also available, where a magnetic sheet can be freely rolled back and forth for partial reproduction.

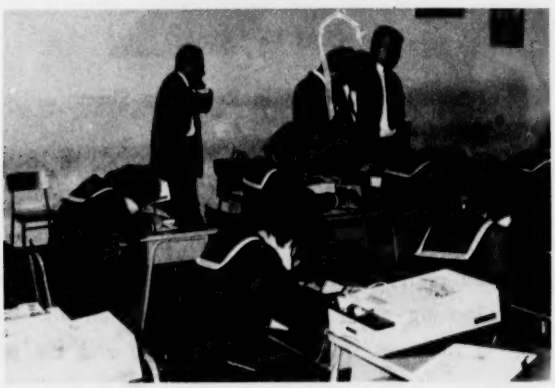


Photo 19. Study with Magnetic Sheet

5. Overhead Projector(OHP)

The apparatus, which is so devised that the transparent materials of a sheet form are put on the light source and their images are projected overhead from a short distance on the screen on the back of its operator, is called an overhead projector(OHP). It has the merits that any dark room, as required in case of slide films, is not needed, but clear pictures can be projected in a bright class-room, and that a teacher can directly give instruction to students by presenting teaching materials face to face with them.

On transparent sheets or rolls, teaching materials for OHP can be printed in pictures or can be handwritten in grease pencil, pen or plastic ink. It is free to compound materials by piling two to seven transparent sheets or conversely to take them apart by removing sheet by sheet. Projection can be made even when real articles are placed instead of a sheet.

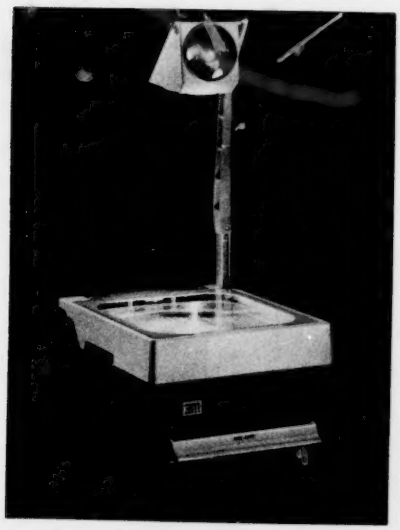


Photo 20. OHP

The material, which is as large as 25cm. by 25 cm.(17 cm. by 17 cm.), can be clearly and precisely projected by using a halogen lamp.

Whether teaching materials can be presented effectively depends on how well a teacher may devise the way of their presentation. While presentation is made fundamentally by projecting a whole sheet like a wall picture or map, there are many cases, where just a part of the sheet is presented by covering the remainder with something opaque so as to have learners concentrate their attention on it for specific comprehension, or where it is used for arrangement, through simultaneous instruction, of the items previously learned, prior to use of other types of instructional instruments.

There is also a case, where effective use of an overhead projector is made by having each student produce and present teaching materials, thus having all students participate in the study.

For example, it is possible, by using an OHP, to present a sheet put down by students and compare it with other similar sheets or the materials on a model sheet. In using an OHP, however, with the materials always projected on a screen,

Photo 21. OHP Sheet

Photo 22. Use of OHP

students are inclined to be possessed just with the items presented there so that their learning attitude may get passive. Thereupon, a teacher should keep it in mind to polish up the teaching materials and contents precisely and provide students with an ample time to think about the teaching materials presented so as to participate in the study positively.

Photo 23. OHP and Personal Study

OHP materials, which are mostly presented by a teacher repeatedly in the course of simultaneous instruction, have to be the distinct and accurate ones, based on a common theme, which would stimulate the learners' independent consideration. It is also necessary to have students arrange learning contents and

experiences into a sort of concept after each study, as the means of having them fully understand what they have learned.

Thus, what plays an important role in using an OHP is not the structure or operation of the machine but the teaching materials. In preparing teaching materials, the method is taken either of first writing materials on a drawing paper as a mother sheet and then printing them on a transparent sheet, or of putting down materials on a transparrent sheet from the outset. By the way, the mother sheet should be preserved also for accumulation and future correction of materials.

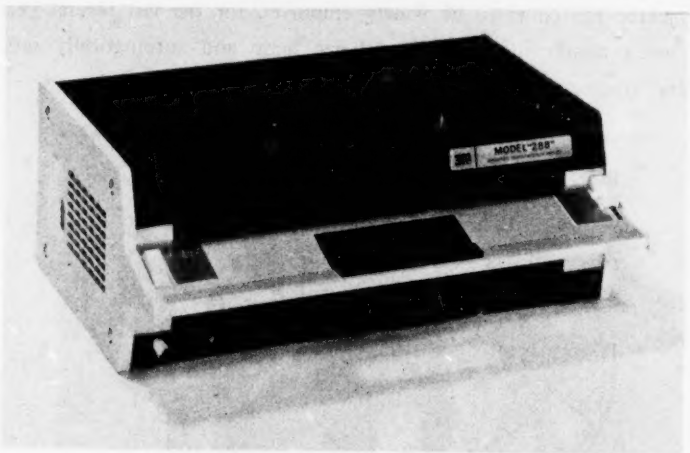


Photo 24. OHP Sheet Reprinter

6. Movie Projector

(a) 16-mm. Movie Projector

16-mm. films form the mainstay of educational motion picture films. Ways of movie viewing are classified into the individual viewing, where each student views a movie individually, group viewing, where a group of students gain the same experience by viewing the same movie at the same time, and television viewing, where students view movies transmitted to television sets by the tele-cinematic apparatus.

While 16-mm. movies form the mainstay of educational movies in Japan, standard 35-mm. movies are taken by certain schools. Plenty of 16-mm. movie films are on sale in the market, but schools usually borrow for use those films from either of more than 1,000 film libraries stationed in local cities. The quality of those films is claimed to be among the highest standard in the world.

What should be kept in mind, first of all, in making educational use of movies is their one-way traffic-like character and the big influences they exert, as one of mass communications media, on dissemination of the information through mobile description of specific and real affairs. Movies are equipped with the features unobtainable from other types of educational instruments, in transforming the specific affairs in daily experiences into abstract affairs through macroscopic and microscopic presentation in vivid pictures, thereby controlling various movements, time and space.

For enhancement of the quality of projected colour films, an auto-loading type movie projector has come to be widely employed for the last several years, which produces much clearer films with a halogen lamp and automatically sets films in the machine in several seconds.

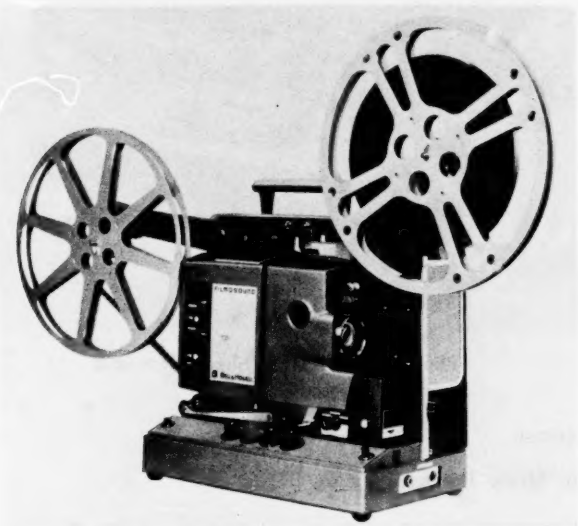


Photo 25. 16-mm. Projector

And, as the trend grows among schools of producing films by themselves, a projector, which records and reproduces not optically but magnetically has also been developed. What is of primary importance to the best use of movies is for a teacher to grasp and arrange specifically the values and characteristics of respective films as teaching materials.

(b) 8-mm. Movie Projector

Unlike 16-mm. movie projectors, 8-mm. movie projectors are cheap and easy to handle. Therefore, most of 8-mm. movies are the self-produced ones. Because of

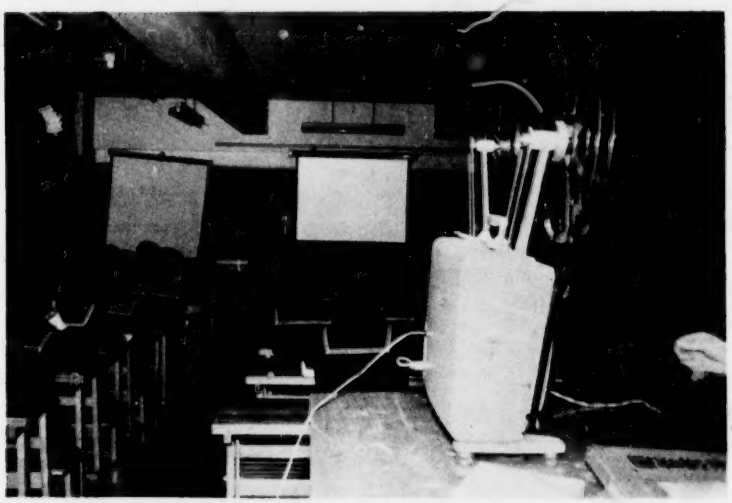


Photo 26. Use of Movie

slight inferiority in the quality and distinctness of pictures, these movies are mostly projected by individual students or small group of students. In the conventional 8-mm. projector, the voice was not produced, so that the voice was supplemented from a separate sound recorder or the sound was recorded, for reproduction, on a magnetic-applied film. But nowadays the projectors and cameras for optical recording and reproduction are on sale in the market.

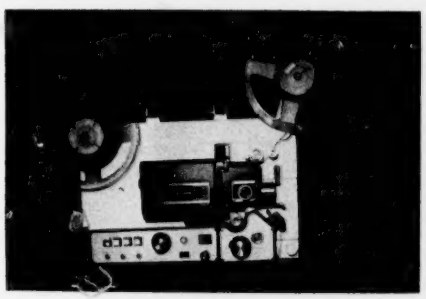


Photo 27. 8-mm. Movie Projector

Photo 28. 8-mm. Movie Camera

Most of the films encased in projectors are of auto-loading type. These

films, rolled in cartridges, are effectively used by individual students or a group of students through 8-mm. projectors containing screens. And there is also a cine video recorder (CVR), which does not project the contents of an 8-mm. film directly on a screen but reproduces them on a television set for around 5–20 minutes together with the voice.

Photo 29. Projector

Photo 30. CVR

There is a concept film, in which the traits of both a 16-mm. film and 8-mm. film are incorporated. Being the one, in which an 8-mm. film is placed into a plastic cartridge, it is so convenient for conservation that it has been adopted by each school since around 1967. It can compile, for repeated projection, a certain conceptual fact into an 8-mm. film of around 4-minute duration with respect to the scene not accompanied by actions. So, it is effective in helping students comprehend the concepts for each small unit in a given subject.

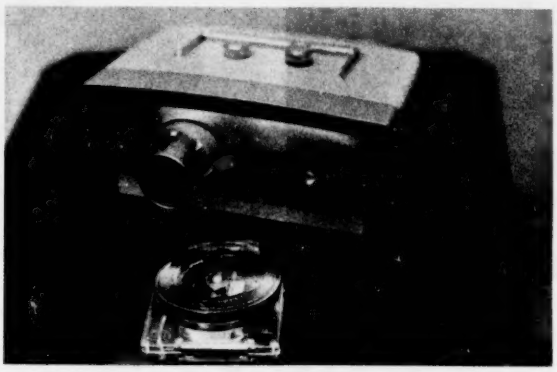


Photo 31. Concept Film Projector

At present, the concept film projectors, which do not reproduce the voice, are generally used, but the ones, which can reproduce the voice of 20 to 30-minute duration, are also marketed.

7. Video Tape Recorder (VTR)

(a) Industrial VTR

VTRs, developed in the U.S. in 1958, had been imported into Japan at first and came to be domestically produced and marketed around 1964. While being predicated on the same theory as that for the initially manufactured 2 inch-wide VTR of 4-head rotation, the recent VTR had its mechanism greatly simplified.

Photo 32. Film Magazine

VTRs, which reproduce the television signal pictures video recorded on the magnetic tape, came to be prepared in schools in a short time following the start of television and have been rapidly developed with simultaneous use of ITV cameras, unlike other types of audio-visual instruments, for whose diffusion it took a long time. Introduction of the method of video recording the pictures and general phenomena on the tape or sheet with a television camera has immensely enlarged the potentiality of education, as well as the use of radio and TV teaching materials.

Photo 33. VTR

Most of VRTs used in Japanese schools are what is generally called the industrial VRTs and use 1, 1/2 or 3/4 inch-wide magnetic tapes. They are different from the VRTs, used in TV stations, which video record on 2 inch-wide tapes. And the type of video recording head, which rotates 30 times per second, is adopted in nearly all of VTRs. And these VTRs can reproduce slow motion and steal pictures.

Tapes with the video recording duration of 60 minutes, 30 minutes and 20 minutes each are also available. Their resolution, averaging 300, does not pose any difficulty for educational use.

Photo 34. VTR

In 1969, all VTR producers unified the standard of VTRs, with a result that all tapes were made interchangeable among all different brands of VTRs. On each one of these tapes, video recording can be made up to the duration of 60 minutes at a speed of 19.05 cm. per second. VRTs have grown popular, chiefly because both the telecasted programmes and self-produced programmes can be easily transmitted by using a VTR simultaneously with a television receiver, and everybody can freely use it without any high-level technique for its operation being required. A VTR is used for varied purposes, such as video recording the school TV programmes for application to a part of lessons, and video recording teaching materials, for various types of instructional instruments, compiled in adaptation to the contents of lessons. As the methods of transmitting pictures, there are the dispersive management method, in which the programmes is reproduced for each subject area and subject by VTR installed in each class-room, and the concentrative management method, in which different programmes are transmitted through 1–3 channels by a VTR installed at a studio set up in a defined place of a school and each class selects one of those programmes for viewing.

It is so important to secure the good quality of pictures, video recorded with a VTR and transmitted to many children TV sets, that it is necessary to install a mother-type VTR. For the purpose, video recording is made at times on a 1 inch-wide magnetic tape of a VTR, as indicated in Photo 33, or the one, as

indicated in Photo 37. The tape's speed is set at 22–25 cm. per second, or faster than in case of a small VTR, and its horizontal resolution is also set at more than 300–350 lines.

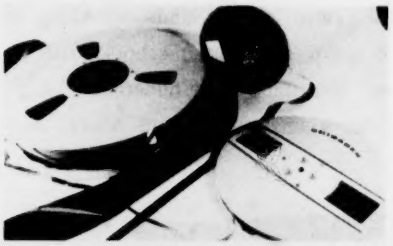


Photo 35. VTR Tape

Photo 36. Lesson with Use of VTR

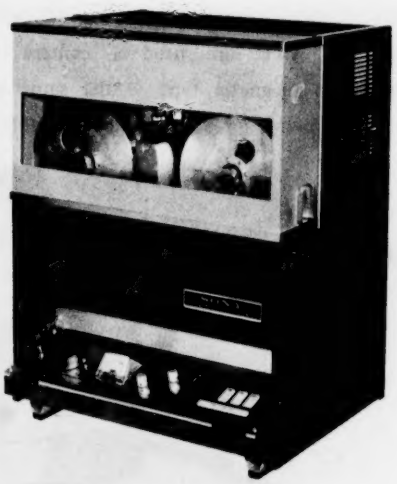


Photo 37. VTR

A TV camera is necessary for self-production of programmes. At schools, industrial TV cameras, both for black-and-white and colour picutres, are chiefly used. Video recording and sound recording are made on a VTR by using two to three cameras of this type, whereas, as a device for adjusting the pictures without changing them by respective cameras, there is a sound-picture tuning desk, in which a programme receiver, pictures' output switch, camera input selector, picture mixer and communication circuit are encased.

Photo 38. ITV Colour Camera

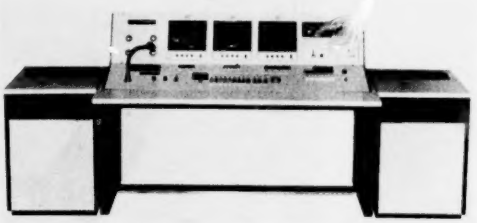


Photo 39. Picture-Sound Tuning Desk

There is a portable VTR as a device for outdoor video recording, which cannot be made with an ITV camera which is for use in a studio and calss-room. A handy video tape recorder, which uses a battery as an electric source and is slung over the shoulder, is also used for video and sound recording the out-of-school activities, physical education and sports guidance at school. With this type of VTR are used a camera with an electronic view-finder and a 0.5 inch-wide magnetic tape – the same as that for a small VTR – on which 20 to 30-minute video recording can be made.

Photo 40. Handy VTR

Next, brief presentation is to be made of the TV picture video recording and reproducing instruments, whose study and development recently got under way.

(b) Video Cartridge Recorder (VCR)

Industrial VTR (home VTR) is easy to handle, because it is used under the premise that a magnetic tape rolled on an open reel is rolled onto another empty reel fixed on the other reel wheel.

Photo 41. VCR

In 1970, a video cartridge recorder, which could reproduce black-and-white and colour pictures, was put on sale. It is started just by lightly pushing a magnetic tape kept in a plastic case, and therefore, is widely used for in-enterprise education and various sorts of publicity activities. Two types of tapes are available, one of 0.5 inch in width and the other of 3/4 inch in width.

(c) Video Sheet Recorder (VSR)

Unlike a VTR, which is used by rolling a long tape on a reel, it makes video recording and reproduction by rotating a discal magnetic sheet. It records a sheet of TV picture in a concentric circle each time the discal magnetic sheet rotates – up to 360 sheets of pictures of 250 mm. in diameter each. Like a general type of VTR, it can video record and reproduce both school TV programmes and self-produced programmes. And this reproduction can be made in about a 60-fold slow motion. Because of its high resolving power, it will be effective for recording of observations, analysis of actions, personal study, etc.

(d) Selectorvision (SV)

Being announced by RCA in 1962, it is a video recorder-reproducer, that is generally called a selectorvision. It resembles a VSR, but its disc is a vinyl sheet. It recordds and reproduces movie film teaching materials on a vinyl film as holographical cross stripes by exposing them to the laser ray. It has the merit of great many prints being provided very cheaply.

(e) Video Disk (VD)

Its method of reproduction is similar to that of a VSR. A colour picture of around 5-minute duration can be video recorded on a vinyl disk of 200–210 mm. in diameter and 0.1 mm. in thickness. There are 140 lines of 1 mm. in width each on the disc, and video signals are reproduced from piezo-electric elements through repeated vertical motions made on those lines by rotating the disk 1,500 times per minute or at the rate of 25 rotations per second. And one TV picture is video recorded for each disk rotation.

(f) Electronic Beam Video Recorder (EVR)

Being announced by CBS in 1967, it has been marketed in Japan since 1970. while a VTR and VSR are used by video recording picture signals on a magnetic tape or sheet, an EVR records TV pictures on a 9 mm-wide film.

It video records TV pictures, with electronic beam, puts those pictures into a plastic cartridge, and then video records and reproduces the colour TV pictures of about 25-minute duration and black-and-white pictures of around 50-minute duration by shifting films at a speed of about 152 mm. per second. Their

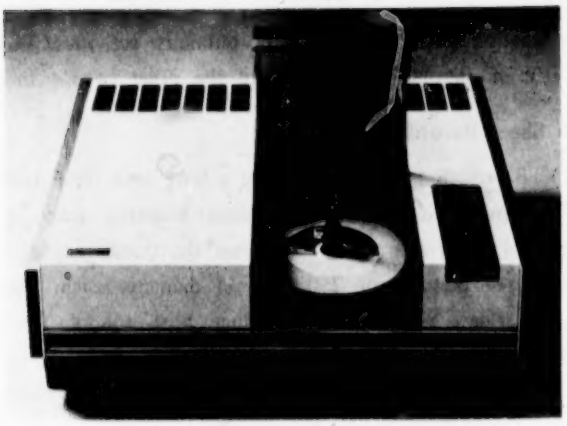


Photo 42. EVR

resolving power is more delicate and particular than that of the ones video recorded on a magnetic tape. And yet, it is impossible to make video recording with an EVR at school or home, as is done with a small VTR.

(g) Cine Video Recorder (CVR)

As indicated in Photo 30, it reproduces TV pictures on films, using movie films directly as TV pictures. It reproduces on a TV set, through optical sound recording and reproduction, the pictures and voices of an 8-mm. film encased into a cartridge magazine and made endless. It is the instrument effective for a special small group study or for personal study.

(h) Fixed Head Video Tape Recorder

In case of an ordinary VTR, a magnetic tape is sent at a high speed of 190–250 mm. per second and moreover, a head also rotates at a high speed, so that such troubles occur, as abrasion of the tape and head. In order to avoid this sort of troubles, just a tape is sent, as in case of a sound recorder, for video recording and reproduction. A magnetic tape with the same width as a 1/4 inch-wide sound tape is used.

8. Response Analyzer

In school education these days, a teacher has mostly come to give effective instruction by using a black-board, wall maps, and various types of audio-visual teaching materials and instructional instruments in a class-room accomodating 40–50 students.

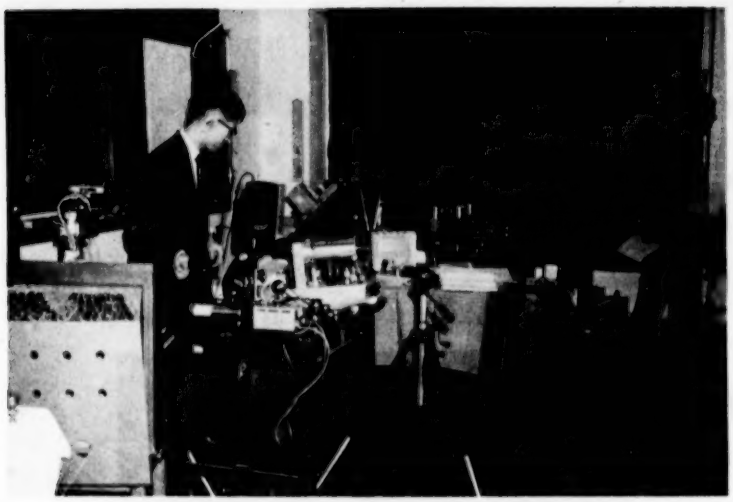


Photo 43. Use of Educational Instruments

A teacher gives instruction on a certain course and subject to a group called a class. In giving instruction here, he is charged with the task of presenting the information, which forms his teaching contents and evaluating the results of his instruction, and has to try to have students fully comprehend the contents of his instruction and present the preliminary informaiton for the instruction in the following stage, while grasping the state and results of students' study. An analyzer forms a part of the system designed at promoting students' smooth and effective study by taking over a portion of such task of the teacher.

This instrument is not new at all, but used to be emplopyed by various circles with a view of conducting the surveys on the reaction to appreciation of movies, the response to various inquiries, etc. In Japan, it has been introduced into the spot of school education since 1959, being utilized for measurement and testing of the effects of audio-visual education, modernization of learning methods, development of scientific educational technology, analysis of teaching machanism, and the like. It served to analyze the contents of instruction and grasp the ever-changing state of students and their reaction to instruction, thereby learning the response to the conveyed information and making the instruction more effective. The analyzer is composed of a terminal unit machine for presenting learners' comprehensive response to the result of instruction, an indicator showing individual students' responses, and a device which records and memorizes those responses in sequence.

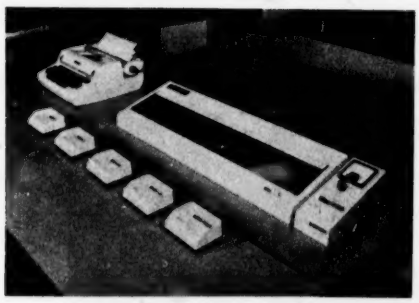


Photo 44. Analyzer

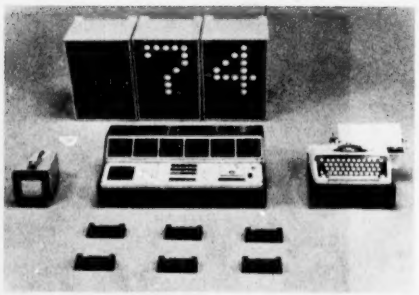


Photo 45. Analyzer

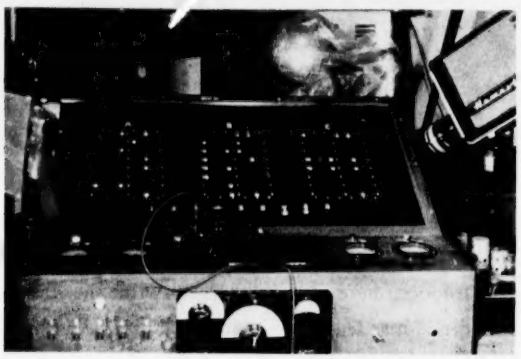


Photo 46. Analyzer

Out of the terminal unit machines, symbol buttons representing alternative answers are furnished on students' desks, while audio-visual educational instruments, such as a slide projector, VTR, OHP, etc., and an indicator, which indicates the students' answers by lighting lamps, for each signal, are furnished on the teacher's desk. Also prepared are a typewriter and a simple electronic computer for recording the kinds of signals representing individual students' responses, as shown in the indicator, and the total number of correct and wrong answers. In giving a lesson by using an analyzer, it is important, first of all, to prepare the reliable presentation and evaluation programmes carefully chosen for evolution of instruction. Then, the teacher presents the instructional programmes, learns the degree of students' understanding through response buttons and finds out, in the course of simultaneous instruction, what students demand and what obstructs their learning, while students are grappling with the study in not a passive but an aggresive attitude, so that the favorable results of group education can be achieved.

It is not desirable, however, to give too many tests to students within a given unit hour, when the method is adopted of presenting questions, for

summation of the lesson or on the way of teaching, through such audio-visual information transmitting media as movies, slide films, television, etc., and recording, as the data of evaluation, the students' responses indicated on a terminal unit machine by having them choose one of the alternative answers including correct and incorrect answers. It is also possible for a teacher to use an analyzer for learning the progress and snags in the exercises and experiments and for checking the proper way of careful instruction, by obligating students to show their response at times in the course of experiments, observations and exercises in a class.

Viewed from the teacher's angle, an anlyzer is such a convenient instrument as to enable him to grasp quickly and precisely the bottlenecks in the simultaneous instruction and take proper corrective measures in the stage of the following instruction. And yet, since learners show their responses by answering questions through symbols representing alternative answers, it is rather difficult to learn, the existence of haphazard correct answers, the students' thinking process, the causes of wrong answers and the process of trial and error. Particularly it is impossible to provide appropriate instruction to backward students and those students displaying exceedingly swift progress. Consequently, the instructional method has gradually been adopted of combining an analyzer with the system of personal study.

9. Language Laboratory (LL)

The device of training students on hearing and speaking of the foreign language by presenting the teaching materials prepared before hand, through the recorded tape, to each student of a group and having the latter record both the teaching materials and his voice with his magnetic recorder, is called the LL.

The LL entails a huge amount of expenses, since it calls for the providing of instruments to all of learners, unlike the case of other types of educational instruments, where just one unit is furnished each for a class or a group of students. But its educational effects are so tremendous that it has been installed in many schools of different levels in Japan, ranging from universities on the top to lower secondary schools on the bottom.

The primary function of a LL lies in enabling individual learners to perform study at their own pace. That is, each learner can make effective study by repeating the process of comparing, as many times as needed, the results of his study with the correct responses for respective questions and themes. And yet, it should be recalled that, even under the formula of simultaneous teaching in a class, students can be led to perform personal study conforming to their respective scholastic ability and progress by using interphones and appropriate

teaching materials. Accordingly, organic and three-dimensional teaching materials and technology have to be developed for the LL teaching, lest it should descend to the mere abstract instruction in which too much is counted on the traits and peformances of instruments.

Photo 47. LL Booth

Until around 1970, nearly all of the magnetic recorders for LL use in Japan had been the three-motor open tape recorders, in which a different motor was used each for rolling, rolling back and reproducing tapes, but, in recent years, cassette tape recorders, which are more convenient for maintenance and handling, have begun to be employed. And, having been equipped with picture transmitting device, the LLs, installed in schools these days, have grown into the more effective apparatus, where the language exercise can be made by appealing to both the visual sense and auditory sense.

In the LL teaching, the following method is generally adopted; that is, a teacher sends several types of teaching materials, prepared in consideration of discrepancy among students in the scholastic ability, out of a tuning desk to students in 4-5 different channels, whereas each student chooses one of those channels at his own will, records on the tape both the conveyed teaching materials and his answers thereto while listening to the teaching materials and answering them, and compare his answers with correct answers. And then, this process is repeated.

In case cassette tapes are employed, the necessary number of teaching materials have only to be recorded on cassette tapes in advance, so that each student may select either of those tapes according to his wish and start his study immediately.

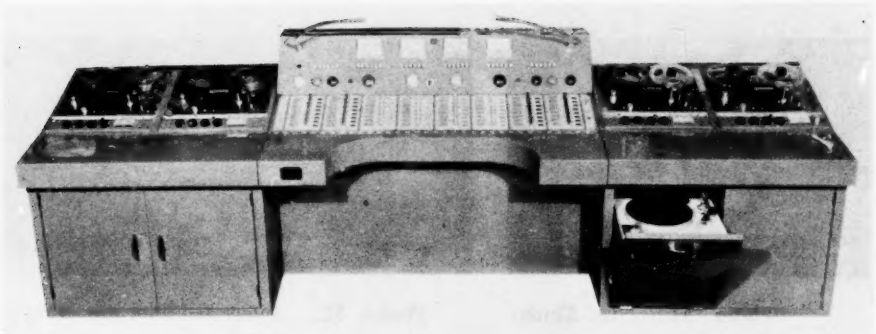


Photo 48. LL Tuning Desk

Most of tuning desks are so devised as to enable a teacher to send out teaching materials, and monitor and talk with each one of students.

Photo 49. Cassette Recorder for LL

Photo 50. Cassette Recorder for LL

Since it is inconvenient to roll back the tape by hand in making the repeated exercise by using a cassette tape recorder, a more efficient cassette tape recorder for LL has been developed, in which the tape automatically goes back for reproduction to the starting point of recording when a leanrer wants to compare his recorded voice with the instructor's voice.

The other type of instruments are also available, which are so elaborately devised that the characteristics of various sorts of instructional instruments may be ingeniously combined (Cf. Photo 52).

Photo. 51. LL Studio

Photo. 52. Integrated Educational Instrument

10. Programmed Instruction

Education through programmed instruction is not the one, in which too much empahsis is placed to the instructional method and technology for use of educational instruments, but the one, to which extensive application is made of instructional theory predicated on pedagogical psychlology.

In Japan as well as in overseas nations, this category of education has been implemented since before with considerable favourable effects. It was first initiated in the form of programmed text for its specific application to school education. Currently, it forms the basis of a teaching machine and CAI (Computer-assisted instruction). The programmed instruction is one of the instructional technologies for helping each learner student perform personal study. It is designed at helping students attain their goal of study by providing them with the unknown learning contents compiled precisely and systematically in small steps, based on the contents of what they previously learned. The programmed instruction is so arranged as to have each learner carry on study for each one of small steps, and therefore, the learning contents have to be carefully and prudently compiled so as to form a complete set of programmed teaching materials. Programmes have to be plainly described always based on the pedagogical theory and psychology. Their contents also have to be compiled in the way of befitting personal sutdy, that is, in the way in which the active response can be obtained from each learner in the process of teaching the logical and well-balanced contents. while it is hard to classify the instructional programmes or to judge what particular programme is preferable, two types of programmes are prevalent in Japan, one, the linear-type programme, in which the instructional process goes in small stpes in a straightforward manner, and the other, the branching-type programme, in which the instructional contents are branched out in accordance with the learners' response to the results of instruction, shown on the way of instruction. The

linear-type programme is used in presenting the materials in printed matters or slide films. Whereas the branching-type programme, under which learners are provided with the teaching materials for stimulation of their desire to study and have their answers corrected when those are wrong, thereby continuing their study, is used in giving instruction by utilizing books or a teaching machine.

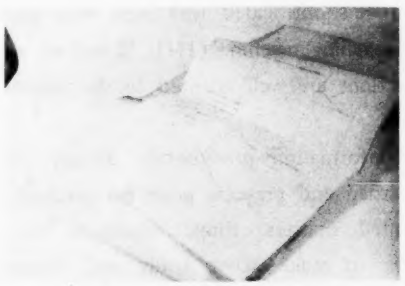


Photo 53. Sheet Programme

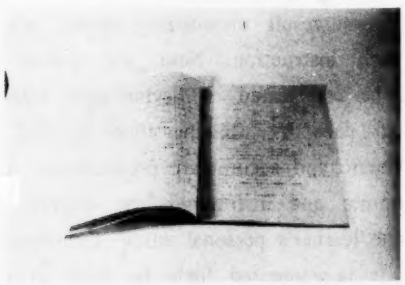


Photo 54. Book Programme

Photo 55. Book Programme

Learners are presented with questions in printed matters, pictures and drawings. Under this learning formula, it is possible to make the feedback for learning the results of study promptly, and therefore, students can study at their own pace. This learning process does not require any expensive instrument but is manageable even with a paper teaching machine. With questions printed in a number of frames on each page, learners are enabled to study on one frame they choose by covering the column of correct answers and other frames with a mask card, and then proceed to the next frame.

In case of the sheet programme and book programme, it is important for a learner to answer questions strictly in the order of number marked without skipping some of them and to compare his answers with correct answers. It is essential to see to it that he should not look at a correct answer before answering a question, and that, when he has produced a wrong answer, he should read the question again and produce an answer anew. Under this programme, a

teacher should take such care as to clarify the objectives of instruction and reinforce the students' response to his instruction in successive steps.

11. Teaching Machine (TM)

A teaching machine is essentially the machine used in teaching students, but, in Japan, the equipment, which allows the instruction to be given under the theory of programmed instruction in the more sophisticated way than with papers and books, as described above, is called a teaching machine (TM). Therefore, what is basically important is that the TM's fuctions are well adapted to the functions required for programmed instruction.

A TM should be equipped with an information presentation device, which informs to learners what is going to be learned and presents problems precisely in small steps through such media as printed matters, films, television, etc., a reaction device, which calls upon learners to make active study and response, provides a clue to a correct answer when a wrong answer is produced and gives necessary instructions for study of the following stage to those who have produced a correct answer, and an instruction result memorizing device, which records and memorizes the results of each instruction. Next, the system of individual instructional technology has to be established of having each learner carry on his personal study at their own pace by utilizing these devices as mentioned above. It is also necessary to prepare and accumulate programmes. And a tremendous volume of teaching programmes and instruments are required in undertaking the TM instruction, based on the learner's personal study. Consequently, in Japan, the instruction with a TM is implemented little by little in the course of simultaneous instruction, with respect to certain units or portions of each subject. Under the system of personal study, each learner performs study according to the pace of his progress, and therefore, it is made the teacher's job

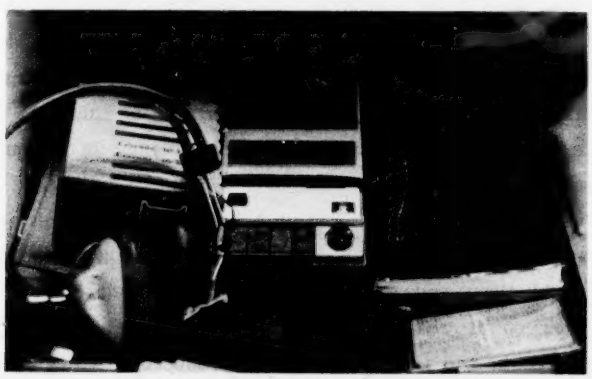


Photo 56. Sound Recorder and Sheet Programme

to manage the pace of progress of each student and provide him with the proper counsel and programmes, based on the data obtained from such management.

(a) Programmes for a Teaching Machine

Instructional programmes for application to a TM have to be so arranged as to present questions for each step according to the progress of each student's personal study, give instruction smoothly by keeping the latter's response under control, and be well adapted to the functions of a TM. One of the important programmes for application to a TM is the type of one that can make pertinent reaction and analysis in accordance with the change of contents. In Japan, linear-type programmes had preceded, but branching-type programmes have also been on steady increase. As one of the latter type of programmes is there the alternative answer selection programme. It works as follows. Each learner is made to select one of several answers, including both correct and incorrect answers, presented beforehand, and push a button bearing the symbol representing the answer he has chosen. Then, he is instantly informed of whether he was right or wrong, and in case he was wrong, a clue to the correct answer is indicated automatically.

Questions are presented mostly in the form of a 35-mm. film of cinema scope size or standard size, put in a slide mount, or in the form of a rolled film. One of those examples is to be shown in Chart 2.

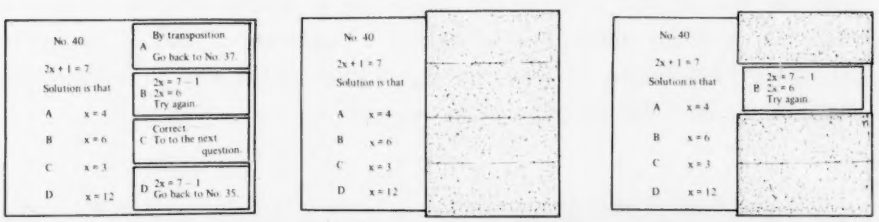


Chart 2. Examples of Programming

At the outset, only the left half is shown to a leaner, while the right half is concealed. After he pushes the switch bearing the symbol representing one of the answers he has chosen after undergoing instruction, a part of the right half is presented so as to show the causes of his error and clues to a correct answer when his answer was wrong. While presentation may be made in films, cards or printed sheets, films will be the most economical.

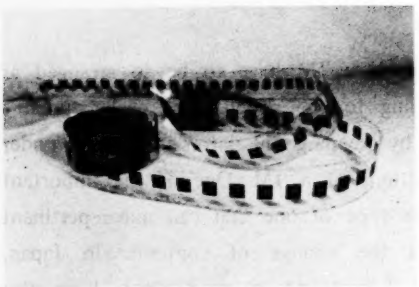


Photo 57. Programmed Film

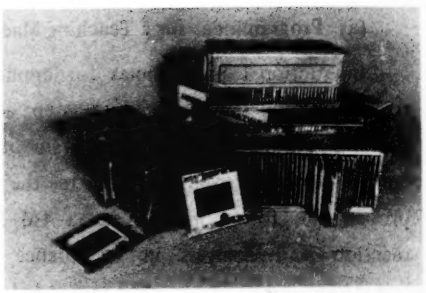


Photo 58. Programmed Film

Photo 57 indicates the one, in which a programme was taken in a 35-mm. single frame and printed. It is cheap, but amendment, exchange and addition of the programme are difficult. After a programme has been taken into the 35-mm. film of double size, each frame of the film is cut out, mounted on a cardboard of 2 inches by 2 inches and then is put into a special magazine for presentation as questions. Its example is indicated in Photo 58. With pictures being clear, distinct and colourful, it is convenient in that the programme can be freely amended and exchanged and a feedback mechanism can also be added simply. But it turns out expensive, because it is to be provided to students in a magazine.

Meanwhile, 16-mm. microfilms are very cheap and easy to keep. Their colour films can also be used with ease. In case of the programme film, as indicated in Photo 59, a 16-mm. rolled film, on which the programme is taken in pictures, is cut out to 15-20 frames, encased into a transparent jacket with an ascetate base, and then put on a TM for presentation as questions.

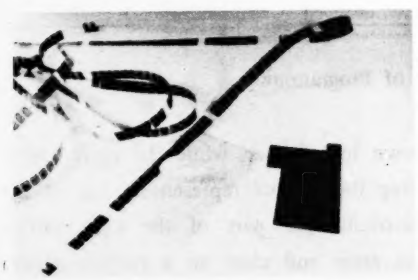


Photo 59. Programmed Film

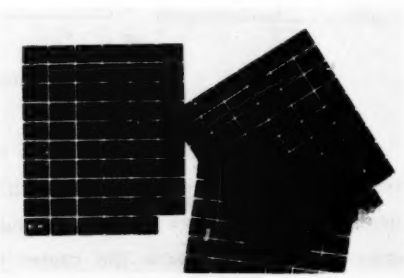


Photo 60. Programmed Film

This film is used as follows. 60–72 frames of pictures, arranged, in 5 to 6 lines at the rate of 12 frames for each line, on a jacket of 6 inches by 4 inches,

are printed on the Kalver film or Diazo film and are distributed to each learner as the programme film for a TM. This film is cheap and easy of reference, unlike a rolled film. As the similar film is there the Fiche film projected directly on a film of 6 inches by 4 inches.

Photo 61. Fiche Film Camera

Photo 62. 16-mm. Film Camera

A Fiche film, whose standard was defined in 1865 in the U.S., is also called the "Federal." The treatment after taking a picture on it, can be finished in 5 to 6 minutes. 72 frames (12 frames in 7 lines) of pictures are taken in the size of 11 mm. by 16 mm. each on the film of 6 inches by 4 inches. Sheet films bearing handy titles are expected to be diffused in future, since they enable the teaching materials to be arranged for each unit and save the labour for reference and maintenance.

(b) Teaching Machines

Next, various types of teaching machines, in which these types of films and printed cards are used, are to be described below.

(i) In the machine, as indicated in Photo 63, questions are presented on the cards, on the surface of which pictures and charts are printed. If a learner pushes with his finger the part of a correct answer after looking at a question, the sound, "pico, pico," is issued because electrical conductive ink is applied to the part, right behind the correct answer, on the back of the card. Yet, if he pushes the part of a wrong answer on the surface of the card, no sound is issued, since electrical conductive ink is not applied to the part right behind it on the back of the card. Thus, he can learn instantly whether his answer is correct or not. there are

several types of devices coming under this category.

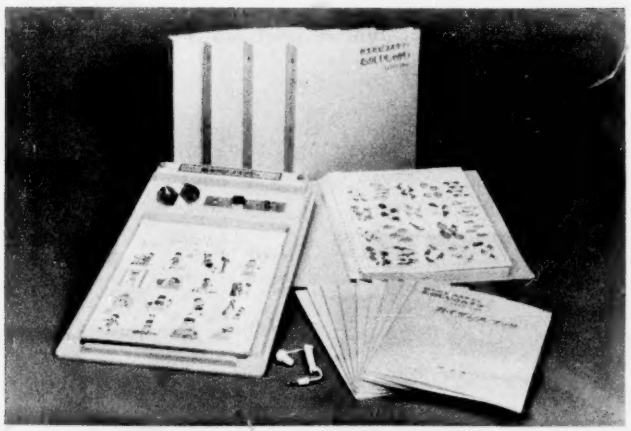


Photo 63. Sheet TM

(ii) The machine, as shown in Photo 64, is so devised that questions are presented on a 35-mm. rolled film of single frame size and the commentary is given for each frame. A learner can study by himself by using it. Various kinds of machines of this type as well as the teaching materials therefor are on public sale.

Photo 64. TM

(iii) In the teaching machine, as indicated in Photo 65, a rolled film of single frame size is used. While alternative answers are indicated in symbols on the film, the portion of a correct answer is punched

beforehand. A learner pushes a button representing one of those alternative answers after looking at the question presented on the film. If it is a correct answer, the film automatically shifts so as to present the next question. In case of simultaneous teaching, by pushing appropriate buttons on the desk aside a teacher, all the films are shifted at the same time, the commentary is conveyed to each machine and the correct one out of alternative answers is also indicated by lighting on the indicator. It is also possible to make simultaneous use of this machine with an analyzer.

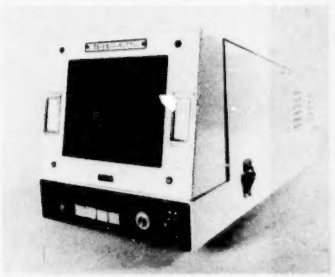


Photo 65. TM

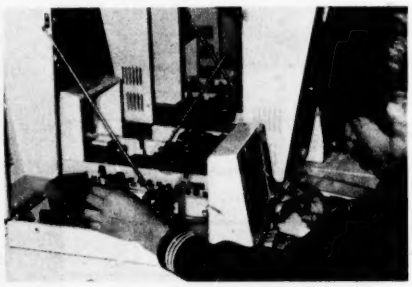


Photo 66. Reality of TM Instruction

In order to have students understand the instructional contents efficiently and effectively, it is desirable, for each one of the teaching materials divided in small steps, to have students answer each question, inform them instantly whether their answers were right or not and provide them with the clues to the correct answer.

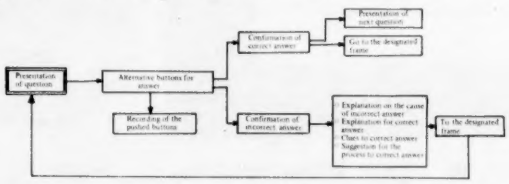

Presentation of question
Alternative buttons for answer
Recording of the pushed buttons
Confirmation of correct answer
Presentation of next question
Go to the designated frame
Confirmation of incorrect answer
Explanation on the cause of incorrect answer
Explanation for correct answer
Clues to correct answer
Suggestion for the process to correct answer
To the designated frame

Chart 3. Learning System for Individual Study

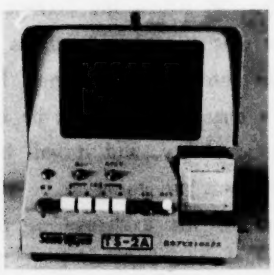


Photo 67. TM

Photo 68. TM Instruction

(iv) The machine, as indicated in Photo 67, presents questions by using a 35-mm. film of double size. Films, put in a cardboard mount of 2 inches by 2 inches each, are encased in a magazine for every 36 reels. Learning is made according to the following process. Only when a correct answer is given, the film automatically goes forward, whereas, when the answer is wrong, it moves back to the instructed point for restudy.

(v) In the machine, as indicated in Photo 70, the instructional program is copied on the Fiche film on a scale of around 1/20, and 72-144 frames are presented. Diazo films are chiefly used. This is the hand-driven teaching machine designed for self-diagnosis and self-correction.

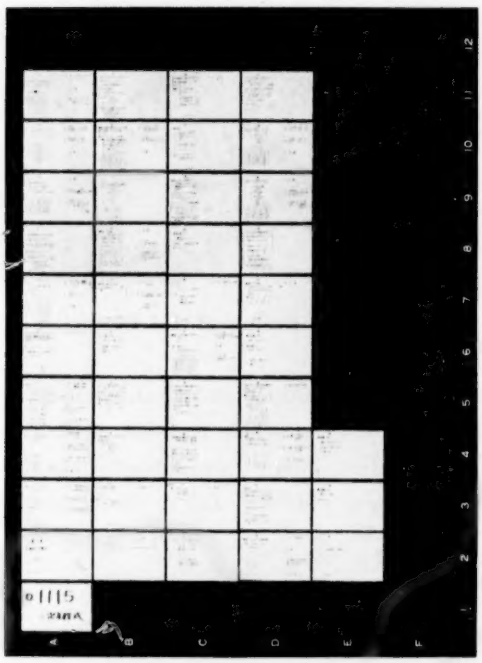


Photo 69. Fiche Film Programme

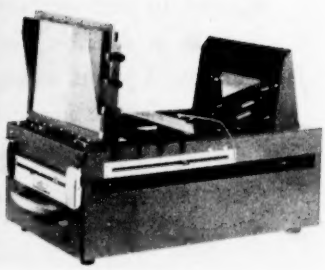


Photo 70. TM

It is charged with a cassette tape recorder, in which the commentary or a foreign teacher's model voice is recorded on a magnetic tape. Study is performed in small steps by stopping the tape through an automatic stop signal. If just one reel of film, where questions are presented, is charged, it will not be enough for the sutdents with an advanced level of scholastic ability, and it will have to be exchanged with another film when the related items are going to be studied. So, in order to save the waste of time involved in the exchange of films, such devices have been developed, as the one, in which two reels of Fiche-type Diazo

films are rolled on a cylindrical glass, and the one, in which the annual instruction programmes, prepared for each unit of a text-book, are linked together so as to be presented without exchanging films.

Photo 71. TM Instruction

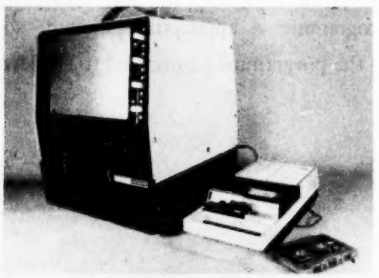


Photo 72. TM

Photo 73. TM Instruction

Photo 74. TM

With these teaching machines designed chiefly at having students perform self-study by using the presented questions, and commentaries thereon and clues to answers, a teacher has no way of learning the causes of errors students have committed, order and process of their thinking, etc. during their study made by using this machine. Therefore, teachers give tests to students whenever he considers it as necessary. The TM, as indicated in Photo 74, is the one designed at enabling a teacher to learn promptly the state of students' trial and error, and the course and progress of their study. In this machine, if a student pushes a button, representing one of alternative answers to the question presented on the Fiche film, he will learn whether his answer is correct or wrong and learn the

clue to the correct answer when he is wrong, on one hand, while a card will be produced at the same time, which is punched at the point defined for each symbol. So, by looking at this card or putting it on a special distinguishing device, the teacher can immediately learn whether the student has mastered the items previously taught or lacks a rudimentary scholastic ability and whether the programme is appropriate or not, so that he can handle the instruction according to the programme conformed to the level of the students' progress.

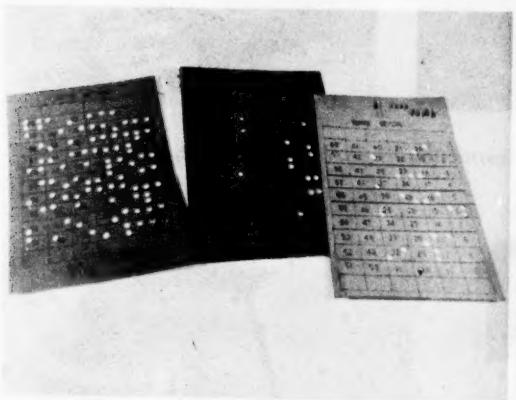


Photo 75. Recording Paper for Results of Instruction.

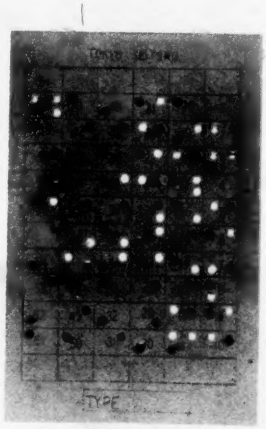


Photo 76. Recording Paper for Results of Instruction.

12. Computer-Assisted Instruction

It is generally called CAI. While it is possible to have students make personal study by using a teaching machine or under programmed instruction, a large number of terminal unit machines and instructional programmes are needed in undertaking the instruction, most suited to individual students, in the course of group study, or in implementing the non-graded system. So, it is far beyond the power of the teacher to keep coordinating and controlling the contents of individual students' study, on top of the jobs he has to handle, as mentioned above. This is why an electronic computer began to be introduced. This is called the CAI system.

Under the CAI system, the programme adapted to each student's scholastic ability is always furnished in the course of study in a large group and his errors are promptly corrected and adjusted during his study. In the meantime, since the results, analysis and evaluation of students' study are reported to the teacher in a short time, he finds out the most suitable learning method for each student from among lots of data and establishes the most suitable instructional method based

on such findings.

In Japan, the stage of research has been passed for CAI, and producers have now begun to instal the test equipment, with a step forward taken toward its practical application.

Photo 77. CAI Terminal Unit Machine

Questions sent from terminal unit machines are presented in TV pictures, photoelectric pens, etc., while the information on the responses to instruction is transmitted by a switchboard, keyboard, typewriter, telephone, CRT, teletypewriter etc. When a CRT (Cathodo Ray Tube) is used, the method is adopted of entering answers in a light pen. With the device for expressing the response with voices being still on the way of development, it is impossible at present to distinguish the figures and contents. Accordingly, the indication of response is made just in a limited degree. What is specially important in the CAI must be the software. Considerable financial burden and superbly excellent instructional programmers are called for in preparing qualitatively superior teaching materials in a large quantity.

Photo 78. CAI Study

F. F. Kopstein and R. J. Seidel report on the expenses required in introducing the CAI system into schools*. This report produces the following figures on the required expenses, by quoting the example of IBM (International Business Machine Corporation).

In case of instructional terminal unit machines for CAI to be provided to 448 persons and an electronic computer for control of those machines are introduced, the monthly rental will total $28,800, while the monthly software cost for a computer and that for instructional programmes will amount to $5,360 and $16,700 respectively, supposing that 448 persons study in 10 class-rooms.

In Japan, no report has been produced as yet on the estimated cost of CAI, but it may be estimated as follows, by taking into account the rentals for domestic computers and terminal unit machines as well as the data as quoted above. That is, if the CAI is planned to be provided for six hours a day, the total daily cost will run up to $2,000 for 100 students and $4,000 for 500 students.

*(AV Communication Review, 16, No. 2, 1968; "Hardware Cost Survey of CAI Education")

CHAPTER V
COMBINATION OF VARIOUS MEDIA

Teacher may try to expand his teaching function not only by means of OHP, TV, TM or Response Analyzer, but also by means of their various combinations.

In other worlds, teachers are to expand their instructional functions by means of man-machine systems such as combination of teacher-made devices and equipment and by means of automatic educational devices and equipment systems, which may be called teaching machines.

After the experiment we have found that the combination of OHP and Response Analyzers is effective in teaching Social Studies at primary school. In the said experiement the same teacher taught the same content to two different groups of pupils who had equal abilities during the period of 20 successive school hours by means of two different educational methods – namely the experimental class by using the OHP, slide projector and Response Analyzer, and the other by means of conventional lecture-type instruction. The result was that pupils in the experimental class gained better scores in shorter time. It was noted that the experimental class could learn the same content in 35 minutes whereas the controlled class took 45 minutes. It is evident that efficiency and effectiveness of the teaching are increased by means of educational devices and equipment.

CHAPTER VI.
OPTIMIZATION OF TEACHING-LEARNING PROCESS

In addition to the combination of various instructional media, the leading teachers are trying to find the effective way to optimize the components of teaching-learning process in order to make the instruction effective. To imporve the effectiveness of teaching, it is necessary for teachers to select proper educational objectives and content adapted to learners, to make use of optimum teaching methods and evaluation methods, to provide proper teaching materials, equipment and facilities, and to organize an appropriate group of teachers and learners.

In the combination of the components of teaching-learning process, the use of instructional media should be incorporated in it as an important factor. In order to find the law of instruction and to construct and design the best course of study, teachers must observe and analyze their own teaching, so that teaching activities are to be improved.

CHAPTER VII.
CONCLUSION

Our life has been undegoing vairous changes under rapid scientific and technological innovations in recent years.

Most of the knowledge and skill acquired at school become less valuable year by year and even obsolete in a short time after graduation from school. The value of the so-called walking dictionary and seniors, which had been held in respect until a decade ago, has been diminishing fast. This tendency is supposed to be further accelerated in parallel with the progress of information on technology.

And our regional community relations, which used to function as our mental nome for long on a basis of so-called "neighbourhood," have gradually dimmed due to the development in the means of transportation and communications, being replaced by the human relations and specially have expanded beyond the regional boundaries. It is because it has become much easier than before for every person to keep associated with a large number of different groups at the same time and exchange the information with other people by means of communications without travelling, and for those living seprately in distant districts to get together in a meeting. Nowadays, the new sense of solidarity, reared among these people, has been exercising the same function as the previous sense of solidarity that used to be cultivated through geographical proximity. Social relations seem to have been so changed that the mutual aid in the daily life as well as in the ceremony of adulthood, marriage, funeral and ancestral worship takes place on the basis of not so much the geographical proximity as such human relations that may be called the information-based proximity. Such a change is supposedly ascribable primarily to the fact that mutual communication between people, which used to be predicated on geographical proximity, has become able to be actively made between mutually remote areas.

The ideal human image demanded in such an era as stated above is that of those people who do not stick to the existing information, which is getting quickly superannuated, but can always obtain, arrange, select and create the new information for exchange with others. That is, they should be, so to speak, the persons equipped with the ability to collect, handle, collate exchange and create the information.

The conventional formula of school education alone is inadequate for raising such persons. While it is taken for granted that effective improvement has to be made in school education itself, the opportunity of education has to be expanded

at the same time. It will be particularly improtant to enable people to continue their study in ceaseless pursuit of the new information through the gradual development life-long education, including pre-school age education, adult education and social education.

Active employment of various instructional media will promote improvement of the instructional and learning process. And effective application of those media particularly through the broadcasting-telecasting and communications technologies must be immensely contributory to the improvement and expansion of the opportuniry of education as well.